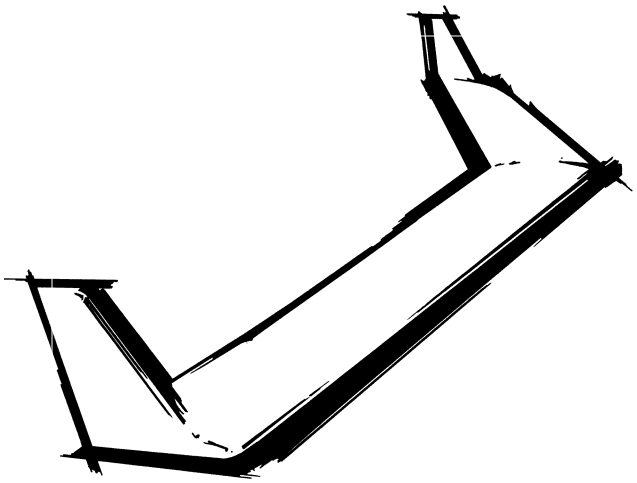

On the 'Wing...

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Redwing, *Part 2*

The two meter version of *Redwing* is now on the building board and is about half completed.

One major change has been made since the preliminary planform as published in the February 2005 issue of *RC Soaring Digest*; the stationary portion of the trailing edge between the aileron and elevator has been eliminated. This area was a source of unnecessary complexity and made it harder to retain structural integrity across the span. The included planform sketch shows the modification. The wing trailing edge is now a continuous piece of 3/32" balsa sheet placed vertically between the upper and lower 1/16" balsa sheeting.

The spar system presented the most difficult design problem. As a swept back wing bends, the wing tip takes on some amount of washout (leading edge down). The opposite happens with a wing which is swept forward. For this reason, we want to make sure the amount of bending is held to an absolute minimum. We created a triangular box spar which will both restrain twisting and dramatically reduce bending.

The *Redwing* spar system consists of full span spruce spar caps which are right at the 30% chord location, plus an additional set of spar caps which are directed perpendicular to the fuselage center line and which meet the other spar around Rib 5. This forward spar is located on the neutral point and includes the wing rod receptacles. Both spar systems utilize internal webbing, and once the leading edge sheeting is installed the two spars form a box which tapers from root to Rib 5.

With a relatively thick section and an oversize wing rod, wing tip deflection under load should be extremely small.

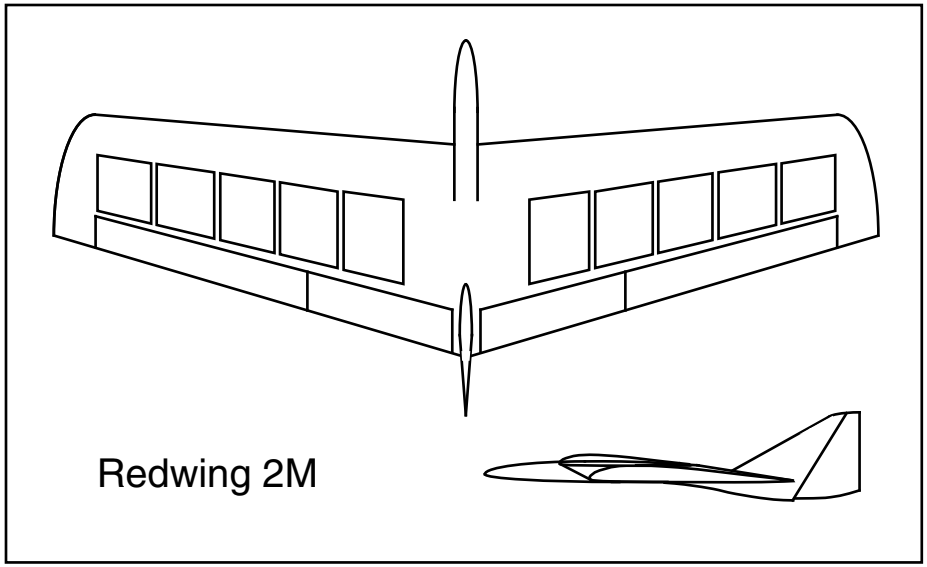
Additionally, there is a short spar connecting Rib 1 (the root rib) with Rib 2 which accepts the equivalent of an incidence rod.

Selecting servos for this two meter version involved a lot of thinking on our part. we wanted to keep servo weight down, particularly outboard, but with such large control surfaces the servos had to be capable of putting out substantial torque.

Sweeping the wings forward has a dramatic effect on the location of the CG, moving it forward about 5.5 inches from its location on the *Blackbird* planform relative to the leading edge at the wing root. Rather than adding lead, we've decided to add a NiCd and use a five cell battery pack, and this voltage increase boosts servo output by about 25%.

We've installed Hitec HS-425BB servos to drive the elevator halves. These servos put out 57 oz.in. at 6.0 Volts. We reversed the direction of one of these servos by reconfiguring the internal wiring (see "Modifying a Servo for Reversed Operation," *RC Soaring Digest* August 2003), so they are mounted in mirror image fashion. A Hitec HS-225MG (67 oz.in. at 6.0 Volts) controls each aileron.

All of the pushrods are of the heavy duty type and incorporate 4-40 clevises at the



Above: Overview of new Redwing planform showing modifications made to wing control surfaces. The stationary portion of the wing which separated the aileron and elevator has been eliminated.

Right: Wings under construction. Of particular note is the main spar system, composed of two subassemblies, which will be tied together by the upper and lower surface D-tube sheeting. Elevator servos are mounted to Rib 2, aileron servos to Rib 4. Still a lot of 1/16" sheeting to go!

servo arm and ball links at the control surface.

The linkages do not attach at the inner end of the control surface, but rather further out. For the elevators, the control horn is outboard of Rib 2, near the center of the surface; for the ailerons.the control horn is outboard of Rib 4, about one quarter of the surface span. The elevator and aileron control horns themselves will be inside the control surface and consist of heavy electronic circuit board.

The wing control surfaces are constructed for top surface hinging. This means the servos will be pushing for up, but with the heavy duty hardware and direct linkages to the control surfaces, there is likely little cause for concern.

We've now started planning the internal structure of the fuselage. The wing servo wiring provides six inch leads at the wing root, so the receiver will most likely be placed within easy reach near the wing leading edge. The rudder servo, with its own separate factory installed lead, will be placed in front of the receiver and connected to the rudder through a standard Gold-N-Rod™ push-pull cable system. The five cell battery pack will of course be as far forward as practical.

The vertical fin will consist of the usual sheeted rib structure of the original Blackbird, but the rudder will be of open bay construction.

We should have this airplane completed by next issue, and look forward to sharing the remainder of the building process - and test flying - with *RC Soaring Digest* readers.